



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

## A NEW GYMNOSPORANGIAL CONNECTION

F. D. FROMME

The genus *Gymnosporangium*, according to Kern,<sup>1</sup> is represented in North America by some 32 species. Of these, all but one are heteroecious, the aecial stages being found on members of the Hydrangeaceae, Rosaceae, and Malaceae families, while the telial stages are restricted to the family Juniperaceae. The single autoecious species, *Gymnosporangium bermudianum*, bears all its spore forms on species of *Juniperus*. Because of this limited selection of hosts, as well as their unique morphological characters, the members of this genus have been classed among the most restricted and isolated of the rusts. Until recently, no aecial stages were known on other than pomaceous hosts and it had been assumed that they were restricted to the family Malaceae. The first exception to this rule was established by Arthur<sup>2</sup> in 1908 when *Gymnosporangium exterum* on *Juniperus virginiana* was successfully cultured on *Porteranthus stipulatus*, thus adding the family Rosaceae to the list of aecial hosts. The further addition of the family Hydrangeaceae was made by Arthur<sup>3</sup> in 1911 when *Gymnosporangium gracilens* was shown to have its aecial stage on *Philadelphus* and related genera. These three families are evidently closely related and are all included under the order Rosales.

As a result of a series of observations, followed by successful inoculation tests, the writer is now able to extend the list to include a fourth family, the Myricaceae, and to establish the identity of *Aecidium myricatum* Schw. and *Gymnosporangium Ellisii* (Berk.) Farl. This work is a part of the series of "Cultures of Uredineae" that have been in progress at the Purdue Experiment Station under the direction of Dr. J. C. Arthur since 1899, and is published by permission in advance of the 1914 report.

The establishment of the connection between *Aec. myricatum*

<sup>1</sup> N. Am. Flora 7: 188-211. 1912.

<sup>2</sup> MYCOLOGIA 1: 253-254. 1908.

<sup>3</sup> MYCOLOGIA 4: 63. 1911.

and *Gym. Ellisii* not only carries the aecial hosts of the genus to a group outside of the Rosales but to one that is apparently widely separated from them in phylogeny, the Myricales being the fourth order of Dicotyledoneae in Engler and Prantl's *Natürliche Pflanzenfamilien*, while the Rosales is the eighteenth. This is not in itself so surprising, as similar wide ranges of hosts are known in other rust genera. It shows, however, that the species of *Gymnosporangium* are a much less restricted group than was formerly supposed, and suggests the possibility that the aecial hosts of other unconnected species may also be found in groups other than Rosales.

The aecium of *Aec. myricatum* is of the cupulate type, a type which has only recently been recognized as occurring in the genus *Gymnosporangium* and is at present known in but two species, *G. Blasdaleanum* and *G. Sorbi*, in addition to the one under discussion. The remaining species of *Gymnosporangium* have aecia of the cornute type, which had for a long time been considered exclusively diagnostic of the genus. *G. Ellisii* in addition to its cupulate aecia has the hamaspora or phragmidium type of teliospores, in which the teliospore has commonly more than two cells, the variation being from two to five. *G. Blasdaleanum* also has cupulate aecia and teliospores of the hamaspora type, but *G. Botryapites* has teliospores much like those of the two foregoing species and cornute aecia. The telial stage of *G. Sorbi*, of which the aecia are cupulate, is unknown.

The suggestions that have led to the establishment of this connection were obtained from a morphological study of the aecium supplemented by field observations on the association of hosts. A quantity of the aecium on *Myrica carolinensis* was collected at Woods Hole, Mass., in 1912, by the writer, for a morphological study. The evident germ pores of the aeciospores and other features suggested that it might possibly be the aecium of a *Gymnosporangium*. In May of the following year, 1913, Dr. R. A. Harper, Dr. B. O. Dodge, and the writer made a trip to the pine barrens at Lakehurst, N. J. Both *Gym. Ellisii* and *Gym. Botryapites* were found there in abundance on the southern white cedar, *Chamaecyparis thyoides*, and three possible alternate hosts, *Ame-lanchier canadensis*, *Aronia arbutifolia*, and *Myrica carolinensis*

were found in the vicinity. After a search, old aecia were found on *Myrica* leaves of the preceding year. Material of both species of *Gymnosporangium* was taken to New York City. *Gym. Ellisii* was sown there on *Aronia arbutifolia*, *A. nigra*, and several species of *Crataegus* without result. No *Myrica* plants were available for use. *Gym. Botryapites* was sown on *Amelanchier canadensis* and *A. Asiatica* and produced pycnia and aecia on both. The Lakehurst region was again visited in August of the same year and aecia were found on *Amelanchier*, *Aronia*, and *Myrica*. The aecium on *Amelanchier* proved to be that of *Gym. Botryapites*, the one on *Aronia* was *Roestelia transformans*, and that on *Myrica*, *Aecidium myricatum*. Since *Gym. Ellisii* had failed to infect *Aronia* in the trials made at New York, it seemed probable that *Myrcia* would prove to be its alternate host. This solution would still leave *Roestelia transformans* without a telial connection and another *Gymnosporangium* should be present in the vicinity.

A third trip to Lakehurst was made this spring, May 1914, and a quantity of *Gym. Ellisii* was obtained and sent to the Purdue Experiment Station for culture work. The germinating teliospores were sown, May 6, on *Aronia arbutifolia*, *Amelanchier canadensis*, and *Myrica cerifera*. The sowings were made by Mr. C. A. Ludwig, who was in charge of the rust cultures at that time. Although the leaves of the *Myrica* were quite small at the time of inoculation, a vigorous infection resulted, and an abundance of pycnia were produced on May 18, and aecia on June 6. No infection was produced on either of the other trial hosts.

The distribution of *Aec. myricatum* conforms with that of *Gym. Ellisii* in that both are found along the Atlantic coast from Massachusetts to Delaware. The latter, however, is also known from northern Florida and southern Alabama, while *Aec. myricatum*, so far as I can ascertain, has not been collected at any point south of Delaware.

*Aecidium myricatum* was named and briefly described by Schweinitz, in 1832, from a specimen on *Myrica cerifera* sent him from New York by Dr. Torrey. This description has been amplified somewhat by DeToni in Saccardo's *Sylloge Fungorum* but is

still incomplete. I am therefore appending a description of the pycnia and aecia with the complete synonymy of the combined species and its distribution. The first name applied to the telial stage was *Podisoma Ellisii* Berk., in 1874; which was, however, antedated by the Schweinitzian name.

***Gymnosporangium myricatum* (Schw.) comb. nov.**

*Caeoma* (*Aecidium*) *myricatum* Schw. Trans. Am. Phil. Soc. II. 4: 294. 1832.

*Aecidium myricatum* Schw. Trans. Am. Phil. Soc. II. 4: 309. 1832.

*Podisoma Ellisii* Berk. Grevillea 3: 56. 1874.

*Hamaspora Ellisii* Körn. Hedwigia 16: 23. 1877.

*Gymnosporangium Ellisii* Ear1.; Ellis, N. Am. Fungi 271. 1879.

*Phragmidium Ellisii* DeToni, in Sacc. Syll. Fung. 7: 750. 1888.

*Tremella Ellisii* Arth. Proc. Ind. Acad. Sci. 1900: 135. 1901.

O. Pycnia epiphyllous, gregarious, in crowded circular groups. 2–5 mm. in diameter, on blackened areas, subepidermal, orange-yellow, globose in vertical section, 140–190  $\mu$  broad by 175  $\mu$  deep; ostiolar filaments 30–80  $\mu$  long.

I. Aecia hypophyllous, fructicolous and caulicolous, in crowded groups, on discolored hypertrophied areas, cupulate, 0.2–0.3 mm. in diameter; peridium yellowish, fragile, becoming lacerate to the base, slightly recurved; peridial cells oblong, 26–29 by 32–39  $\mu$ , overlapping, the outer wall thick, 7–10  $\mu$ , smooth, transversely striate, the inner wall much thinner, 2–3  $\mu$ , closely and prominently verrucose; aeciospores globoid to oblong, 24–30 by 27–34  $\mu$ , the wall pale-yellow or colorless, 2–3  $\mu$  thick, closely and strongly verrucose, the pores 6–8, scattered.

ON MYRICACEAE:

*Myrica carolinensis* Mill., Connecticut, Massachusetts, New Jersey.

*Myrica cerifera* L., Delaware, New Jersey, New York.

III. Telia. (For description see N. Am. Flora 7: 203. 1912.)

ON JUNIPERACEAE:

*Chamaecyparis thyoides* (L.) B.S.B., Alabama, Delaware, Florida, Massachusetts, New Jersey.

TYPE LOCALITY: New York, on *Myrica cerifera*.

DISTRIBUTION: Along the Atlantic coast from Massachusetts to Delaware, and in northern Florida and southern Alabama.

EXSICCATI: Ellis N. Am. Fungi 230, 271; Ellis & Ev. Fungi Columb. 55, 62; Thüm. Myc. Univ. 1224, 1936; Seym. & Earle, Econ. Fungi 246; Roum. Fungi Sel. 4921; Rab.-Wint. Fungi Eur. 2920; Barth. Fungi Columb. 4001.

PURDUE UNIVERSITY,  
LAFAYETTE, INDIANA.